

ABSTRACT OF THE DISCLOSURE

In an apparatus which determines characteristics of a thin film according to the present invention, a temporal change in a refractive index  $n$  and an extinction coefficient  $k$  of a thin film in a period from start of a change in the thin film as a processing target (e.g., melting) to end of the change (e.g., solidification) can be obtained with a high time resolution of pico-seconds. Based on this, it is possible to know a progress of a change in state of the thin film (e.g., crystallization) or a transition of growth of crystal grains in units of pico-seconds.